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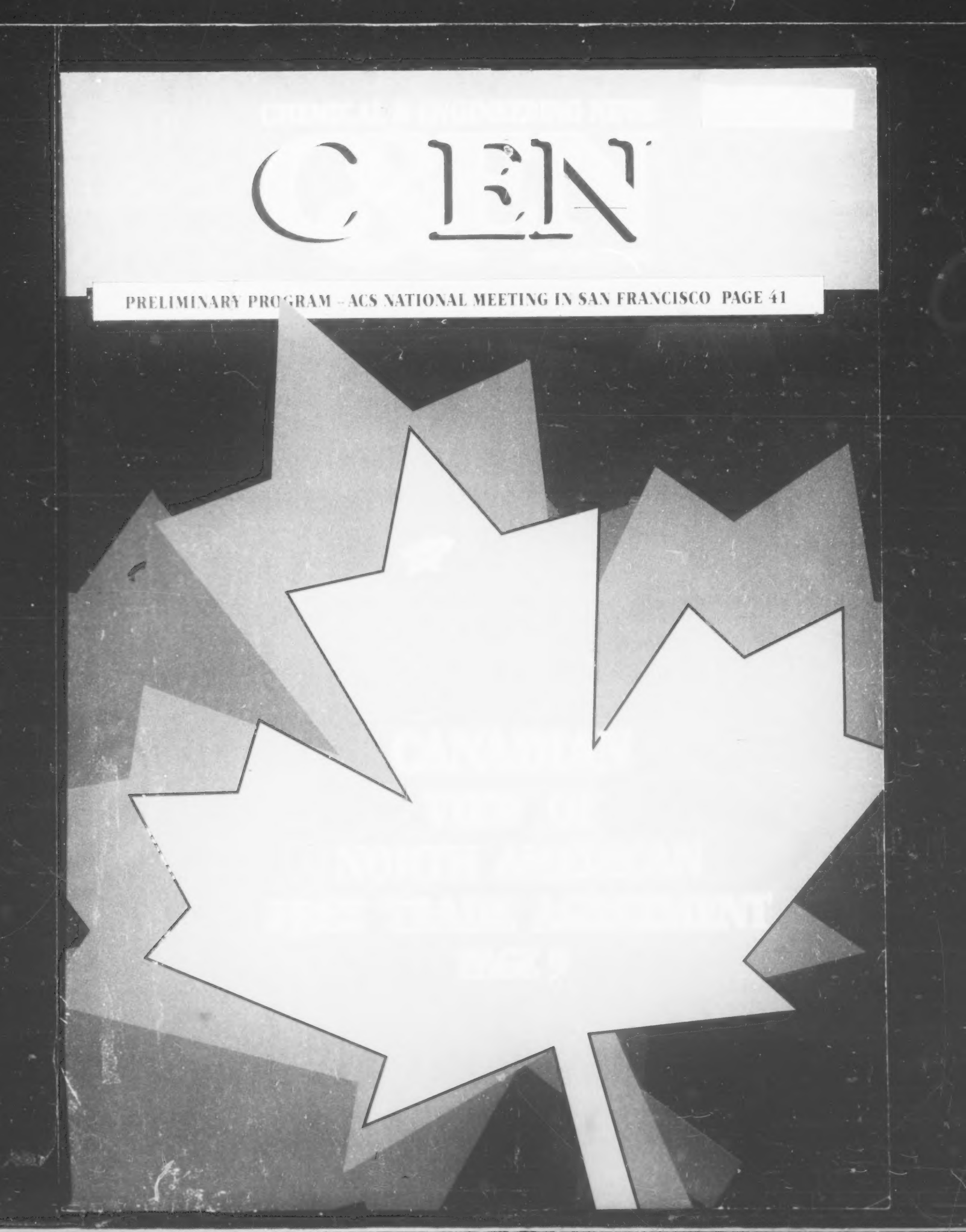

CHEMICAL & ENGINEERING NEWS

C&EN

JANUARY 27, 1992

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- U.S. and China conclude pact to improve intellectual property protection in China, a move expected to benefit U.S. pharmaceutical and pesticide industries. Page 4
- U.S. chemical industry expresses support, with some reservations, for proposed global trade rules, but puts priority on outcome of market access negotiations. Page 5
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LETTERS

Thermophilic bacteria

I was interested to note the letter from Richard Henderson (C&EN, Dec. 23, 1991, page 3) concerning thermophilic bacteria. The role of thermophiles was well known when I entered the canning industry in 1931. They cause insidious flat sour spoilage in canned foods. "Flat," because the can ends are not distended as in other types of spoilage and cannot be separated by external appearance. The soured product is unpleasant to taste, but not toxic.

The thermophiles are very heat resistant and not destroyed by conventional thermal processes. The problem can be avoided by maintaining warehouse temperatures substantially below 120 °F. Thermophilic bacteria are defined in my 1913 Funk and Wagnalls dictionary.

John M. Jackson
Lakeside, Mich.

Ethics in interviews

I sympathize wholeheartedly with Bhajendra N. Barman (C&EN, Jan. 6, page 4) and Molly Gleiser (C&EN, Nov. 4, 1991, page 4) in their complaints about the abuses from interviewers. Their cases were particularly outrageous in light of the current depressed market for hiring in the chemical industry. However, it might be of some interest to the reader to go back to a gentler and kinder time.

In the early 1960s, when I was working for a large chemical company in the Washington, D.C., area, we were trying to recruit a staff in as brief a time as possible for a new research laboratory. One promising graduate student from the West Coast and within a few months of receiving his degree solicited an interview with us and we were only too willing to accommodate him. All expenses were paid both for his trip east and for the best accommodations in the Washington area. After he had completed his day of interviewing, I was assigned to him as his host, and we ate at a restaurant selected by him. During dinner he confided in me that he had no intention of taking the position, and the only reason that he had requested an interview was to obtain a free trip to the East Coast to see his parents—his father in particular.

Without a trace of guilt, he then informed me that his father was an executive vice president in New York City at one of the five largest chemical companies in the country. Needless to say, sitting on the other side of the interviewing process, I was shocked by the unethical treatment from this "potential" employee of our company. Without remembering names, I would not be surprised if the same individual 30 years later is not now screening candidates in the egregious manner described by both Barman and Gleiser. Based on their experiences, a course in ethics should be a requirement not only for the individual chemist but also for all interviewers.

Nelson Marans
Silver Spring, Md.

Supercritical water

As one of the inventors of the supercritical water oxidation (SCWO) process, I am both pleased and concerned by your special report [by Robert W. Shaw et al.] on supercritical water (C&EN, Dec. 23, 1991, page 26): pleased to see the attention that the field is receiving; concerned about the misconceptions that the article appears to have created.

I received a call today from a *Wall Street Journal* reporter who wanted to know how anyone in his right mind would consider doing anything practical in a medium that dissolves gold. The fact is that most of the fascinating (and very expensive) research cited in your article has very little to do with the SCWO process that we at Modell Development Corp. (MODEC) have developed for treating wastes. Our SCWO process is conducted at 500 to 600 °C and 250 bar, where the density of water is less than 0.1 g per cc, the dielectric constant less than 2, salts (and gold) are insoluble, and "molecular charisma" is not to be found. Under these conditions, water is so electrochemically inert that corrosion is far less severe than in hot liquid water at 200 to 300 °C. These conditions are so far removed from the critical point that the thermodynamic behavior of binary mixtures of water and sodium chloride can be modeled by a simplistic Redlich-Kwong equation of state.

MODEC's SCWO process is capable of ultrahigh destruction efficiencies in a stackless system where gaseous effluent is condensed as collected as liquid carbon dioxide. Over the past two years, we've solved the salt clogging problem, demonstrated operation of a bench-scale prototype through 120-hour round-the-clock tests, and completed process design and

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Canadian Chemical Industry Backs North American Free Trade Pact

But companies believe it's better to protect existing market opportunities in large U.S. market than to increase small Mexican market

Earl V. Anderson, C&EN Northeast News Bureau

In June 1990, the presidents of Mexico and the U.S. agreed to negotiate a bilateral trade pact between the two countries. In September 1990, Canada announced that it would join in the negotiations, transforming the trade talks into a springboard for a possible trilateral North American Free Trade Agreement (NAFTA). The negotations still are going on.

Earlier, C&EN examined NAFTA from the Mexican chemical industry point of view (C&EN, Sept. 9, 1991, page 7). In this second of a series of articles, C&EN takes a look at how the Canadian chemical industry feels about NAFTA. A future article will examine NAFTA through the eyes of the U.S. chemical industry.

G. Firman Bentley, senior vice president of Nova Corp. of Alberta until his retirement recently, says that Canada's interest in NAFTA is both "offensive" and "defensive." Many leaders in the Canadian chemical industry express those same sentiments.

Last year, Canada sold $15 million worth of chemicals to Mexico. That's a minuscule 0.2% of its total chemical exports. Even the best offensive weapons that Canadian chemical producers can possibly hope may come out of the NAFTA negotiations will not raise those numbers significantly in the next several years.

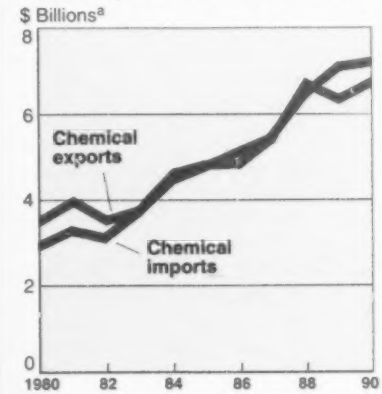
On the other hand, Canada shipped $4.7 billion worth of chemicals to the U.S. in 1990—a whopping 69% of all its chemical exports. It already has a three-year-old free trade agreement with the U.S. Despite its naysayers, the Canada-U.S. trade agreement has provided Canada's chemical industry with such benefits as preferential tariffs and, generally, better and more secure access to its critically important U.S. market.

The feeling runs deep in the Canadian chemical industry that NAFTA negotiations could potentially erode the market access benefits that it has achieved from the earlier bilateral trade agreement. And the industry wants to make sure that its marketing muscle in the U.S. isn't atrophied by a surge of new competition from Mexican chemicals entering the U.S. on terms better than Canadian chemicals already enjoy.

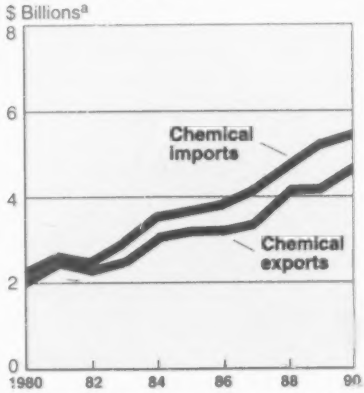
So guess which tactic—offense or defense—looms uppermost in the collective minds of the Canadian chemical industry. As far as NAFTA negotiations are concerned, the industry has taken a page out of professional football's playbook—the emphasis is on defense.

True, any increased chemical trade between Canada and Mexico that may be triggered by NAFTA would benefit the Canadian chemical industry. But that's a long-term proposition.

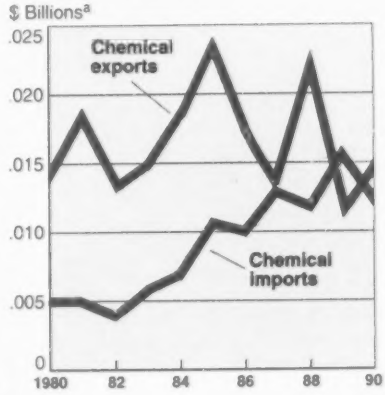
Canada's chemical trade runs in, out of deficit . . .



. . . but deficit with U.S. is persistent . . .



. . . and trade with Mexico remains small



a Converted from Canadian dollars to U.S. dollars on the basis of $1.00 U.S. = $1.14 Canadian. **Source:** Statistics Canada

The immediate concern is protecting the marketing turf it has battled to win in the U.S. and to make sure that the U.S. does not use the NAFTA negotiations to reshape the existing free trade agreement to Canada's disadvantage. Make no mistake: Canada's chemical industry unequivocally supports NAFTA. But Jean M. Belanger, president of the Canadian Chemical Producers' Association (CCPA), says the industry doesn't want to see anything in NAFTA that dilutes the gains it has made in the existing trade pact. "We don't want to see the free trade agreement become unraveled," he says.

This attitude is a microcosm of the attitude that exists in almost all of Canadian industry—and in the Canadian government. When Mexico and the U.S. initiated their bilateral free trade talks, Canada had two options. It could remain outside and look in at the Mexican-U.S. negotiations. Or it could join in the trade talks, making them a trilateral affair. It also could have negotiated its own bilateral trade agreement with Mexico, just as the U.S. was then doing. But that never was much of an option. In essence, remaining out of the negotiations wasn't much of an option either. This would have put the U.S. in the advantageous position of being the only country with tariff-free access to markets in all three North American countries.

Richard G. Lipsey, professor of economics at Simon Fraser University in Burnaby, British Columbia, says a bilateral Mexican-U.S. agreement also would push hemispheric free trade toward a "hub and spoke" arrangement. By this, he means that the U.S. would be a "hub," with separate trade deals with as many hemispheric nations as decide they want to become "spokes." The fear: The U.S. would be able to play one bilateral trade partner off against another.

Belanger: doesn't want gains diluted

Although Canada's immediate benefits from joining the U.S. and Mexico in the trade talks will be limited, the costs of not joining would have been significant. First, in a Mexico-U.S. only pact, Mexico would have gained some measure of preferred access to the U.S. market, just as Canada did under the Canada-U.S. trade pact. That would have meant tougher competition for Canadian companies in their crucial U.S. market.

As a nonparticipant, Canada would not have been able to counter any special concessions that Mexico may have received. And Canadian companies would not have been able to gain as much access to inexpensive Mexican raw materials and products as their U.S.-based competitors. Remaining on the outside, Canada would have had to react to whatever came out of a trade deal between its two North American neighbors.

Canada's exports generate almost 30% of its income and employment. And, for a country that lives so much by trade, repercussions such as these are unthinkable. As Bentley points out, until the free trade agreement with the U.S., Canada was the only industrialized country besides Australia and New Zealand whose industries did not have free access to a market of at least 100 million people. The U.S. domestic market is 240 million people. The Japanese market is 120 million people. The combined market of the European Community and the European Free Trade Association is 360 million people. The Canadian domestic market is 27 million people.

With its small domestic market and such a large share of its national income dependent on exports, says Bentley, market access is a key issue for Canada and its exporters. The bilateral trade agreement with the U.S. gives Canadian exporters virtually free and secure access to a market large enough to justify world-scale plants. Now that Canada is a part of the NAFTA negotiations, the trick will be not to lose it.

Canadian companies, including chemical companies, overwhelmingly support the government's decision to join in NAFTA negotiations. Before that decision was made, the Canadian Manufacturers' Association surveyed its members. Of the 323 Canadian companies responding, 88.2% said they favored joining the trade talks. Only 4.6% thought that Canada should stay out—this although only 19% of those companies export to Mexico and only half of them believe that Mexico will become an increasingly attractive market for them during the 1990s. And the Canadian Chamber of Commerce adopted a resolution supporting Canadian participation in the free trade talks.

So there's no doubt that industry support for Canada's participation is strong—and widespread. Yes, there was—and still is—some opposition to Canada's participation in NAFTA. For the most part, this opposition is based on environmental issues, or the fear of cheap Mexican labor taking jobs away from Canadians.

However, compared with the uproar in Canada over the U.S. free trade agreement a few years ago, the opposition to NAFTA is tame and relatively muted. One reason is that now that the U.S. pact is a fait accompli, most of the damage already has been done in the eyes of Canadian free trade opponents.

Meanwhile, there are other, much more pressing issues to command the Canadian public's attention. The still-limp economy is one of them. There's also the highly charged and controversial constitutional issue and the possibility of Quebec's seceding from Canada.

Along with other business groups, CCPA, the Canadian chemical industry's trade association, also is glad to see Canada taking part in NAFTA negotiations. "We believe strongly that Canada should be at the table when there's anything going on that may impact our industry," says Belanger.

CCPA says that one of Canada's primary objectives in NAFTA negotiations should be to get Canadian exporters ensured access to the Mexican market "in a fair and reciprocal manner." That's a logical objective, but not a very im-

portant one, as far as the Canadian chemical industry is concerned.

Canada's chemical trade with Mexico is small in both directions. In addition to the small chemical export figure for 1990 of only $15 million, Canada imported only $12 million worth of chemicals from Mexico. Two thirds of those imports are organic chemicals, not surprising since they come from a country whose chemical strength lies in petrochemicals. Canada's chemical exports to Mexico are much more diverse, with most of the emphasis on synthetic elastomers, plastics, and resins.

Not only are Canada's chemical exports to Mexico small, their growth rates are nothing to brag about. Canadian chemical exports to Mexico actually dropped an average 9% per year between 1985 and 1990. Throughout all of the 1980s, they grew at a paltry 0.6%-per-year rate. Obviously, most of the growth occurred in the early eighties. Chemical imports from Mexico have grown, rather than declined, since 1985, but they have grown at only an unimpressive 1.5%-per-year clip.

Even assuming that NAFTA triggers a generous 10% average annual growth rate in Canada's chemical trade with Mexico, chemical exports still would be only $39 million by the year 2000. Chemical imports would be only $31 million. That's hardly the stuff upon which world-scale, export-oriented plants are built.

No wonder Belanger says that "Canadian-Mexican chemical trade is not significant." No wonder the virtually unanimous attitude in the Canadian chemical industry is that the potential for increasing chemical exports to Mexico is limited. It's limited because Mexico itself is a large chemical producer and because U.S. chemical companies have geographical and cost advantages when it comes to exporting to Mexico.

And no wonder few in the Canadian chemical industry are prodding their negotiators to put much emphasis on "offensive" tactics in the NAFTA negotiations. The bottom line for Canadian chemical companies: There's little to gain in the Mexican market, but plenty to lose in the U.S. market.

As a result, the fundamental and key plank in CCPA's position paper on NAFTA calls for extending the Canada-U.S. free trade pact to include Mexico "in a manner that minimizes the need for additional bilateral adjustments between Canada and the U.S." In other words, use the Canada-U.S. trade agreement as the basis for NAFTA negotiations and extend the agreement to include Mexico in a fair and equitable manner.

Belanger stresses that the NAFTA negotiations must not compromise the letter or intent of the Canada-U.S. trade agreement in any way. Rather, they should refine and extend the original agreement. Belanger says that NAFTA negotiations should be used to address areas left unresolved by the original Canada-U.S. trade pact—for example, intellectual property and transportation services. NAFTA trade talks also might try to strengthen the free trade agreement in other areas, such as dispute settlement mechanisms.

Although Mexico is one of Canada's least important trading partners, the U.S. is by far its most important. In 1990, almost 75% of Canada's exports went to the U.S. About 65% of its imports came from there.

In chemicals, the story is the same. Canada's chemical exports to, and chemical imports from, the U.S. represent 69% and 75% of the total, respectively. Equally important, Canada's exports of chemicals to the U.S. have grown an average 8% annually between 1985 and 1990. Imports have grown an average 9% per year. Considering that there were some lean economic years during that period, those growth rates are even more satisfying. Certainly some, if not most, of the credit for this growth in chemical trade between the U.S. and Canada must go to the trade agreement that exists between the two countries.

These statistics help explain why the Canadian chemical industry, along with most other industries in Canada, did not want to see a bilateral U.S.-Mexico trade pact that either of those countries could have used to gain leverage against Canada. And they help explain why Canadian chemical companies attach so much importance to using the free trade agreement with the U.S. as a model for the embryo NAFTA.

C&EN staff photo

Sigurdson: downstream area is problem

Just how severe Mexican competition would have been for Canadian chemical producers under a Mexican-U.S. bilateral agreement, and how severe it will become under NAFTA, is difficult to tell. It could, in fact, turn out to be a nonissue.

Much of Mexico's chemical strength lies in the petrochemical sector, just as Canada's does. Canada has lost much of the feedstock cost advantage it enjoyed in the early 1980s. But it still enjoys a considerable cost advantage in shipping petrochemicals to western, midwestern, and northeastern U.S. markets.

This prompts James Sigurdson to wonder where Mexican petrochemicals will fit into the U.S. market. Sigurdson, managing director of the consulting firm of Law, Sigurdson & Associates in Toronto, notes that petrochemicals from the U.S. Gulf Coast can move northward "a certain distance," while Canadian petrochemicals can move southward "a certain distance." Geographically, he asks, where will Mexican petrochemicals fit into the U.S. market? He believes that, even with NAFTA in place, competition for Canadian petrochemical producers will come primarily from the U.S. petrochemical industry, which is exactly where it comes from now.

Sigurdson suspects that a bigger problem for Canadian chemical companies may lie in the downstream area—in such products as fabricated plastics and specialty chemicals. These products are more labor-intensive than upstream petrochemicals. And Mexico's labor costs are, of course, much lower than they are in Canada. Thus, as Mexico's chemical

industry becomes more sophisticated and starts producing chemicals further down the product stream, it could become a more formidable competitor for Canadian producers.

This scenario may take time to develop, however. Sigurdson says marketing these types of products is becoming a matter of finding "niches." Even commodity resins and chemicals such as ethylene glycol now come in so many different grades and specifications that they are approaching "specialty" status. This kind of grade rationalization and the cost of "grade switching" is an ever-growing problem for chemical companies. But it is a problem in which Canadian and U.S. chemical companies have a big edge over Mexican companies.

Such analyses notwithstanding, there still remains the overriding concern that if Mexico gets to enjoy free trade status with the U.S., competition from the Mexican chemical industry will become more intense, whatever its quantitative level. And the Canadian chemical industry thinks that the best way to position itself defensively against that competition is to persuade NAFTA negotiators to use the beneficial existing free trade agreement as its model.

The existing pact, for instance, could serve as a model to develop NAFTA's rules of origin, which CCPA definitely wants included in NAFTA negotiations. These are rules that define the country from which an import originates. This is important in a regional trade pact such as NAFTA because members of the pact logically want to derive most of the pact's benefits. They want to prevent a third-party country from exporting a product to, say, Mexico, where it may enjoy trade preferences, then reexporting it to Canada. The third-party country may not have the same trade preferences in Canada that it has in Mexico, but its exports can sneak into Canada using the trade preferences that Mexico receives from NAFTA.

Consequently, CCPA wants rules of origin written into NAFTA that define those products that will be entitled to duty-free treatment when they are exported from one NAFTA country to another. Products traded duty-free under the agreement should be produced in one of the countries, both of them, or all three of them.

Setting rules of origin, however, requires some balance. CCPA notes that products made from offshore raw materials should qualify for duty-free treatment if they satisfy specific tests. For instance, the rules might require that an appropriate amount of value-added processing be done in one of the NAFTA countries before the product is exported to another NAFTA partner. At the same time, the rules must not be so strict that they offset the benefits provided by other sections of NAFTA.

For chemicals and chemical products, the Canada-U.S. trade agreement specifies that products made with offshore raw materials qualify if they have been "sufficiently changed" in either the U.S. or Canada (or both) so that they are classified differently from their raw materials. Generally, chemicals are classified in chapters 28 through 39 of the harmonized tariff system. Thus, if the raw materials are classified outside these chapters and the product is classified within them, it qualifies for duty-free treatment.

However, if the transformation process results only in a change from one subheading within those chapters to another subheading within those same chapters, then the product must also satisfy another test. At least 50% of its value must be added in Canada or the U.S. (or both). The trade agreement also contains a number of other specific rules for chemicals and chemical products to supplement these basic requirements.

CCPA believes that having these trade rules form the basis for rules of origin under NAFTA would avoid the confusion and complexity of formulating a completely new set of rules.

The association points out that the rules of origin contained in the existing trade agreement are carefully designed to reflect how chemicals are produced in the U.S. and Canada. It also points out that chemicals are produced the same way in Mexico as they are in Canada and the U.S. Thus, CCPA argues that the existing rules should be adopted "as is," with room for "adjusting details" where necessary.

Under the existing pact, it's possible to change the rules of origin if a new or different process for producing chemicals makes it necessary. CCPA thinks that this, too, should be included in the NAFTA rules, along with the consultation procedures provided in the existing agreement. In particular, the association wants NAFTA to include assurances that the regulations governing certificates of origin are fully enforced.

The Canadian chemical industry's attitude on tariffs and nontariff barriers is pretty straightforward. It wants NAFTA to eliminate tariffs on a broad range of chemicals and to reduce nontariff barriers as much as possible. CCPA says an agreement that achieves only "partial" tariff cuts or leaves a "residue" of important nontariff barriers will not achieve what it sees as NAFTA's logical goals. For CCPA, three so-called market access provisions are absolutely essential—complete removal of all barriers to legitimate and fair trade; a guarantee that they won't be reimposed; and a guarantee that new barriers won't be erected in their place during the life of NAFTA.

Basically what the Canadian chemical industry is proposing is "national treatment" of one country's products by another. This means that NAFTA should not allow any of the three countries to adopt internal rules that replace other trade barriers and that favor its own domestic products.

C&EN staff photo

Poisson: government must level playing field

Canada's chemical output tops Mexico's, but lags U.S.'s

Thousands of metric tons	Canada	Mexico	U.S.
Sulfuric acid	3311	3974	40,171
Ethylene	2425	1370	17,001
Ammonia	3602	2632	15,386
Sodium hydroxide	1651	429	10,605
Propylene	766	366	10,037
Chlorine	1542	387	9,925
Benzene	765	320	5,380
Methanol	1884	210	3,624
Toluene	427	368	2,767
Xylene	514	404	2,586
Butadiene	192	21	1,433
Carbon black	178	125	1,302
Polyethylene, low density	1167	348	5,071
Polyethylene, high density	364	176	3,778
Polystyrene	215	130	2,273

Sources: Statistics Canada, ANIQ (Asociación Nacional de la Industria Química), U.S. International Trade Commission, U.S. Bureau of the Census

Tariffs, of course, are part of virtually every trade negotiation. NAFTA is no exception. Over the years, tariffs have lost a lot of their importance as a protectionist device in Canada and the U.S.—and in Mexico as well. Like the U.S., Canada grants duty-free treatment to products from qualified developing countries. In the U.S., the program is called the Generalized System of Preferences (GSP). In Canada, it is the Generalized Preferential Tariffs (GPT). Canada, says one government official, has a long list of GPT products, including Mexican products. Canada's GPT, he says, is much more liberal than the U.S.'s GSP. About 98% of Canada's chemical imports from Mexico enter the country under GPT. In the existing free trade pact, Canada and the U.S. have agreed to eliminate tariffs on trade between the two countries in stages, primarily over a period of five years. In some cases, the two countries have accelerated the staged tariff cuts and already have eliminated duties on many products, including chemicals.

Mexico, too, has reduced tariffs considerably since it joined the General Agreement on Tariffs & Trade (GATT) in 1986. For many chemicals, duties are 15% or less, a far cry from the high rates that existed in the early 1980s. And many chemicals, among them styrene, acrylonitrile, and polyethylene, enter Mexico duty-free.

CCPA thinks Mexican duties on chemicals should be "bound" at these lower rates; that is, raising them would be forbidden. Then, these bound rates should be used as a starting point for negotiating further tariff cuts (or eliminating them completely) in NAFTA negotiations. In some cases, Mexico's effective tariff rates are even lower than the bound rates. In these cases, CCPA wants to see the lower, effective rates used as the basis for NAFTA negotiations.

NAFTA, says Belanger, also should provide a phase-out period, but a limited one, for eliminating tariffs, just as the earlier pact does. This would allow companies time to adjust to the tougher competition that comes with tariff-free trade. Under the existing trade agreement, chemical tariffs can be eliminated in one of three ways: immediate elimination where Canadian and U.S. companies agree to it; elimination over a five-year period (the case for most chemicals); and elimination in 10 annual steps in those few cases where it's justified.

For chemicals, says CCPA, similar formulas could be devised in NAFTA. It opposes any "protracted" phase-in period for cutting tariffs. And CCPA insists that the schedule for eliminating chemical tariffs should be the same for all three countries. This won't sit well with leaders in the Mexican chemical industry. They think that, as a developing country, Mexico should get longer phase-in periods than the U.S. or Canada.

Speeding up the pace of erasing tariffs has worked well under the U.S.-Canada agreement. But CCPA thinks NAFTA can—and should—do an even better job. Under the existing agreement, a company can block accelerated tariff cuts on a product if it produces that product, regardless of how little it makes or how insignificant the company is in the overall business. That has already happened.

CCPA would like to see acceleration rules in NAFTA that establish a "fair and equitable basis" for the degree of producer support needed in the three countries to proceed with an accelerated tariff cut. In effect, it wants to prevent one small producer from upsetting the applecart for the majority of its competitors who may favor accelerating a tariff cut.

Reducing and eliminating tariffs encourage trade, but their benefits can be eroded by nontariff barriers such as import or export restrictions. The Canada-U.S. agreement affirms GATT obligations not to prohibit or restrict imports except under strictly defined circumstances. CCPA thinks NAFTA should do the same thing. Other than for very special exceptions, it wants NAFTA to eliminate nontariff barriers immediately or phase them out over a reasonable period of time.

CCPA singles out export taxes as a particularly disruptive nontariff barrier that NAFTA should prohibit. And any NAFTA pact on nontariff barriers should require Mexico to eliminate its import licensing requirements. In fairness, Mexico has come a long way in abolishing import licenses. But some still exist, including some on chemical and petrochemical products.

The Canada-U.S. trade agreement, says Belanger, also would be an appropriate model for setting up a dispute settlement mechanism in NAFTA. And all three—Canada, the U.S., and Mexico—agree that NAFTA should have one. "The dispute-settling mechanisms provided [in the existing trade agreement] are working well, and we believe they should be incorporated into NAFTA," adds Nova's Bentley.

The existing agreement sets up five-member dispute settlement panels and imposes specific deadlines for them to reach a decision. Panelists are chosen from preestablished rosters. It also sets explicit, relatively short time limits on each step of the process—consultation, conciliation, arbitration, and settlement.

So far, neither Canadian nor U.S. chemical companies have had any direct experience with these dispute settlement provisions. Those in industries that have experience suggest NAFTA negotiators should consider establishing a small, permanent secretariat for the joint commission that

will oversee the trade agreement. They also wonder if the dispute settlement process could be improved by setting up a permanent tribunal under NAFTA instead of the ad hoc panels that the U.S.-Canada agreement provides. Whichever way it goes, the nationalities of the panelists will have to be reconsidered because three, not two, nations will be involved in NAFTA. CCPA says it will watch how these issues develop as NAFTA negotiations proceed.

The U.S.-Canada agreement also has special rules to settle disputes over antidumping and countervailing duty issues. The Canadian chemical industry considers such issues important because its exports to, say, the U.S. can be adversely affected by how the U.S. applies its trade remedy laws, such as antidumping and countervailing duty laws.

Normally, disputes in such cases are settled in domestic courts. But the trade agreement substitutes a dispute settlement panel whose members are from both the U.S. and Canada. It also requires a bilateral panel to review any changes in existing trade remedy laws and establishes working groups to develop new trade remedy laws that benefit both countries.

Mexico's antidumping and countervailing duty laws are similar to those in the U.S. and Canada. Consequently, CCPA says it may be possible to extend the provisions on dispute settlement trade remedy laws to Mexico under NAFTA. However, it has some reservations about using a trilateral panel to replace Mexican judicial review decisions. Why? Because it is not yet certain how Mexican law is being applied and whether it is being applied correctly. CCPA suggests that Mexican, U.S., and Canadian negotiators may have to develop additional guidelines for the panels to use when they review Mexican decisions under its trade remedy laws.

But CCPA hesitates to make specific suggestions, again because none of the trade remedy panels formed so far under the U.S.-Canada pact have involved chemicals.

The association's recommendations are less tentative when it comes to protecting intellectual property. It wants intellectual property rights covered under NAFTA. Its primary interest is patent protection. "There's a strong link between effective patent protection and innovation in the chemical industry," says Belanger.

According to CCPA, each of the NAFTA countries should be required to have adequate and effective intellectual property laws. At the same time, it doesn't want to see those laws become barriers that hinder fair access to technology, as occasionally happens.

Both Canada and Mexico rely on a system of compulsory licensing. And CCPA thinks it should be possible to continue these systems under NAFTA as long as the agreement provides a way to protect against possible abuse.

Along with such things as tariffs, nontariff barriers, and rules of origin, yet another issue has become entwined in international trade negotiations. That issue is foreign investment. It is a major issue in the Uruguay round of multilateral trade negotiations under the auspices of GATT. And it will be an issue in NAFTA, because any trade agreement that combines Canada, Mexico, and the U.S. into a free trade area of 360 million consumers and an annual output of $10 trillion is bound to have an impact on investment flows.

Canada's direct investment in Mexico, and vice versa, is limited. Mexican holdings of Canadian productive assets are virtually nonexistent. And Canada's investment in Mexican manufacturing industries is about $500 million. By comparison, U.S. direct investment in Mexico is about $20 billion and growing rapidly. In Canada, U.S. companies owned $9.7 billion worth of Canadian chemical assets—about 47% of the total—at the end of 1988.

A trilateral free trade pact probably won't do much to stimulate Canadian chemical investment in Mexico. Most of Canada's large chemical companies are subsidiaries of foreign multinationals, primarily multinationals based in the U.S. Deciding whether to invest in Mexico will be done in corporate headquarters, not in Canada. And the money will come from corporate headquarters, not from Canada.

Organics dominate Canada's few chemical imports from Mexico . . .

	1990 chemical imports		
$ Millions[a]	U.S.	Mexico	Others
Inorganics	$ 646.5	$ 0.3	$ 496.5
Organics	1167.1	7.9	641.1
Fertilizers & fertilizer materials	160.9	0	31.0
Synthetic & reclaimed rubber	218.6	0.2	27.1
Plastic materials, not shaped	1168.6	2.1	155.3
Plastic film & sheet	366.5	1.6	74.9
Other plastics basic shapes & forms	360.5	0.2	68.4
Paints & related products	235.5	ns	23.9
Other chemical products	1118.9	0.3	263.5
TOTAL	$5442.9	$12.5	$1783.0

. . . but Canada's small chemical exports to Mexico are more diversified

	1990 chemical exports		
$ Millions[a]	U.S.	Mexico	Others
Chemical elements	$ 143.0	$ 0.1	$ 105.0
Other inorganics	894.4	0.3	0.1
Organics	1082.5	2.5	689.6
Fertilizers & fertilizer materials	863.2	1.7	585.3
Synthetic rubber & plastic materials	832.1	4.7	479.7
Plastics basic shapes & forms	443.2	3.8	36.5
Other chemical products	437.3	1.1	89.4
TOTAL	$4696.1	$14.5	$2091.5

Note: Numbers may not add because of rounding. **a** Converted from Canadian dollars to U.S. dollars on the basis of $1.00 U.S. = $1.14 Canadian. **ns** = not significant.
Source: Statistics Canada

Nova is one of the few major Canadian chemical companies that is not a subsidiary of a foreign company. Armando Notte, manager of government relations in Nova's Ottawa office, says his company might consider investing in Mexico if the investment climate were right. But Nova is more concerned about its exports to the U.S. than investing in Mexico.

About 70% of Nova's polyethylene production, for instance, is exported and much of it goes to the U.S., says Notte. That's where the company's major concern lies. If it has to compete for the U.S. market against Mexican companies in the future, it wants to make sure that the competition is not unfair.

U.S. accounts for bulk of Canada's exports and imports

a Includes Mexico, 0.2%. b Converted from Canadian dollars to U.S. dollars on the basis of $1.00 U.S. = $1.14 Canadian.
Source: Statistics Canada

Nevertheless, CCPA says it wants NAFTA to include investment provisions that treat investors "in a fair and predictable manner." This will allow investments to flow freely among the three NAFTA countries.

CCPA's Belanger notes that Mexico's new foreign investment policy, introduced in 1989, is not all that different from Canada's investment policy. Therefore, CCPA contends that NAFTA should incorporate the existing trade agreement provisions that give national treatment to foreigners who establish new businesses in a country.

However, Canada retains the right to review cases in which U.S. companies acquire existing Canadian companies if the investment is $150 million (Canadian) or more. CCPA thinks this same threshold should be considered for NAFTA.

Like its counterpart in the U.S., the Canadian chemical industry wants something done about current restrictions on foreign investment in the Mexican chemical industry. The Mexican constitution reserves production of primary petrochemicals solely for the government-owned Petróleos Mexicanos (Pemex). Foreign investment in secondary petrochemicals is limited to 40%. There are no restrictions on foreign investment in the new category of so-called tertiary petrochemicals.

These restrictions are a contentious and politically charged issue (C&EN, Sept. 9, 1991, page 7). Mexico's constitutional restrictions notwithstanding, CCPA thinks NAFTA should at least explore the possibility of reclassifying even more petrochemicals than Mexico already has from primary to secondary, and from secondary to tertiary. One other possibility is that Mexico could establish a "threshold review system," similar to the one in Canada. Mexico would review foreign investments in petrochemicals only after they exceed a predetermined amount of money.

The question of foreign investment in Mexican petrochemicals is part of a larger and equally contentious issue of energy. The Mexican constitution restricts petroleum ownership to Mexican nationals. And Mexico's NAFTA negotiators have said that issue is not negotiable.

CCPA agrees that the NAFTA negotiations must respect Mexico's constitutional framework. But it also insists that the negotiations must make certain that petrochemical feedstock supply, price, and access policies do not remain or become barriers to fair competition. Any preferential feedstock policies existing in Mexico must be removed, says CCPA.

Once again, the Canadian chemical industry believes that the free trade agreement provides a good starting point for accomplishing this. In the agreement, the oil and gas sectors are specifically omitted from the investment requirements. Thus, Canada maintains sovereignty over energy resources, even though they must be sold on a nondiscriminatory basis. Although Canada, under the free trade pact, remains free to determine whether and when to allow energy exports and may continue to monitor and license those exports, the pact stipulates that the U.S. must get proportional access if Canada imposes emergency export controls on energy products. These and other energy provisions of the trade agreement, says CCPA, could be adopted in NAFTA without raising constitutional issues for Mexico.

Understandably, the Canadian chemical industry is attaching a lot of importance to NAFTA negotiations. However, some of its problems lie not at the negotiating table, but on Parliament Hill in Ottawa.

Raymond Poisson, manager of government affairs for Dow Chemical Canada, points out why. Dow Canada supports NAFTA, says Poisson. But he adds that the Canadian government must take its own steps to "level the playing field" of international trade for the Canadian chemical industry.

In Canada, interest rates are high to combat inflation. This increases the cost of borrowing. As a result of the high interest rates, the Canadian dollar is exceptionally strong. But a strong Canadian dollar penalizes Canadian exporters when they try to compete in international markets.

There are indications Canada is slowly coming out of recession, but the fear persists that it may experience a "double dip" right back into it. The Canadian deficit is extremely high. Taxes are too.

So, says Poisson, the message to the Canadian government is clear: Do all you can to correct the economic situation in your own ballpark. Without that, no NAFTA agreement, however it's structured, will do much to help the Canadian chemical industry. □

Strong TiO_2 demand draws Du Pont to Europe

Du Pont has its sights firmly set on becoming a producer of titanium dioxide in Europe. Precisely how it will go about making its plans a reality, or when operations will start up, isn't fixed. But there is no lack of resolve.

"There are two ways we could get there," says Dennis H. Reilley, vice president and general manager of the company's white pigment and mineral products division, who gave a briefing on the issue in London. "We could buy a piece of land and build our own plant. However, when one looks at the supply and demand picture in the industry right now, adding new capacity additional to what already is planned is not something that gets one overwhelmingly excited about it.

"That leaves us with the option of making an acquisition. For the moment, at least, that is where our primary emphasis is. We are looking at all reasonable opportunities. If we clearly can't find an acquisition that makes sense to us, we'll certainly give full consideration to building.

"We're trying to avoid setting a deadline for ourselves, because that tends to drive one to make decisions that one might regret at a later date. We are being very particular about what we would buy, and how much we would be willing to spend." He doesn't categorically rule out the likelihood of linking up with an established producer in Europe. But as he puts it, "We are not thinking about a joint venture or any type of partnership operation at this time."

C&EN staff photo

Reilley: looking for an acquisition

Some of the big names on the European chemicals scene are among the eight companies that operate the 17 titanium dioxide production units throughout Europe with an overall annual capacity of about 2.66 billion lb. ICI, through its Tioxide subsidiary, is the largest. Its plants in France, Italy, Spain, and the U.K. have a combined annual capacity rated at 904 million lb (C&EN, June 10, 1991, page 33). NL Chemicals is second largest with some 541 million lb annual capacity spread among Belgium, Germany, and Norway. Bayer, Rhône-Poulenc, and SCM each has capacity on the order of 264 million lb per year.

Existing operations in Europe, however, share a big disadvantage from Du Pont's viewpoint. All except two plants use the so-called sulfate route to titanium dioxide. Du Pont, on the other hand, has opted to concentrate solely on the chloride process for making the chemical, which it pioneered 40 years or so ago.

However, this difference alone wouldn't be sufficient to rule out an acquisition. As Reilley points out, Du Pont has had experience operating sulfate plants in the past. And there is the possibility of converting a sulfate-based facility to one using the chloride approach. "We would clearly prefer to buy a chloride plant. But if we restrict ourselves just to that notion, we would narrow our focus considerably by eliminating the majority of the capacity," he says.

He cites three advantages to the chloride process. On a pound-for-pound basis, the amount of energy required is about half that needed to run a sulfate plant. The number of people involved is fewer, so productivity is greater. Probably most significant, he points out, is that the amount of waste produced is at least a fifth of that resulting from sulfate operations. "These factors combined give the average chloride producer a 10 to 20 cents-per-lb manufacturing cost advantage over the average sulfate producer," he maintains.

This undoubtedly explains why the chloride route to titanium dioxide continues to gain ground at the sulfate route's expense. Currently, slightly under half of global production uses the chloride approach, up from about a third in 1985. By 2000, Reilley believes, the figure will be closer to 60%.

Environmental considerations are of growing importance, particularly for titanium dioxide makers in Europe. There, legislation that sets limits on the permissible amount and nature of the process waste stemming from the operations throughout the 12 member countries of the European Community come into effect next year. "Many European sulfate producers will be required to add acid recycling, and/or acid neutralization, equipment," Reilley says. "Installation of these facilities will call for large capital expenditure, and has the potential to add 10 to 15% to manufacturing costs.

"Clearly, to operate a titanium dioxide plant is becoming increasingly harder to do in terms of meeting regulatory requirements," he concedes. But he isn't fazed by the prospect. "The road to achieving the necessary permits for the plants we are building in Taiwan and South Korea has been extremely difficult and lengthy," he points out. "We found that the [environmental] requirements there are as strict as any in the world. So we are confident that we can get permitted anywhere because the chloride process is much more favorable from an environmental point of view."

Du Pont's plants going up in Taiwan and South Korea will be completely waste-free, as is the one the company operates at Antioch, near San Francisco. "All coproducts of the process are converted to salable items. Everything that leaves our Antioch plant fits into that parameter. The plant in Delaware is about 80% waste-free. Only a

TiO_2 use growing fastest in Asia/Pacific region

Billions of lb	1991	1995	% annual change
Asia/Pacific	1.276	1.573	5.4%
Latin America	0.319	0.369	3.7
Europe/Middle East/Africa	2.486	2.702	2.1
North America	2.332	2.504	1.8
TOTAL	**6.413**	**7.148**	**2.8%**

Source: Du Pont

very small portion of material from the process can be classed as waste.

"We deep-well waste coming from our titanium dioxide operations in Mississippi and Tennessee, and have been doing so for many years. But we clearly recognize that the public perception surrounding this is not good. So we fully intend to discontinue both of these deep-welling operations eventually."

He points to a number of uses for the waste products. Ferric chloride has established itself as a useful water treatment chemical. The iron itself has some commercial value to steel producers, and vanadium and other trace elements are being recovered. Another coproduct is offered as a dry aggregate used in road building. "We have only just scratched the surface in terms of the unique and useful needs that coproducts of the chloride route to titanium dioxide can fulfill," he contends.

Considering that Europe, the Middle East, and Africa are the geographic regions accounting for the highest share of global sales of titanium dioxide, it's surprising that Du Pont only now is getting around to siting production there. Last year, combined demand in those regions amounted to 2.49 billion lb, 39% of the 6.41 billion lb world total. Coming a close second was North America, with 2.33 billion lb (36%), followed by the Asia/Pacific region with 1 28 million lb (20%). Latin America made up the balance with 319 million lb (5%). Annual per capita consumption of titanium dioxide is highest in North America, however, at 7.5 lb against Europe's 4.4 lb value.

After some two years of soft sales demand and price decline, the titanium dioxide industry as a whole currently is running at about 86 or 87% of its installed plant capacity, Reilley says. But with indications of an upturn in use, and the likelihood that some existing sulfate-based capacity will be phased out, he anticipates that capacity utilization rates will range from 93 to 97% by 1995.

In anticipation of its future production plans for Europe, Du Pont meanwhile is taking steps to strengthen its presence on the European titanium-dioxide-based pigments and coatings scene. It has just opened a specialized customer service and technical center in Belgium. It has restructured its Europewide sales organization, and has placed managers in Budapest, Moscow, and Warsaw who call on titanium dioxide consumers throughout Eastern Europe. And it is responding to special market needs there by introducing new products geared to the European paper laminates and plastics operations, as well as pigments for the water-based coatings industry.

Dermot O'Sullivan

Rubber use expected to bounce back in 1992

Not surprisingly, the recession has put a damper on the synthetic rubber market, with demand declining an estimated 3.4% in 1991. But producers of synthetic rubber say they see light at the end of the tunnel.

This year, total North American synthetic rubber consumption—including thermoplastic elastomers—is expected to recover, with growth of 3.7% over 1991, which will restore it to its 1990 level of about 2.77 million metric tons. Consumption then is forecast to rise at an average annual rate of 2.1% through 1996, according to the International Institute of Synthetic Rubber Producers (IISRP) in Houston, which has just issued its five-year forecast. "After the anticipated turnaround in the economy, growth in synthetic rubber is expected to return to traditional rates of growth," says William E. Tessmer, managing director of IISRP.

In particular, thermoplastic elastomers are expected to outpace total synthetic rubber growth by posting a 7% annual growth rate through 1996, says the institute. Substantial gains are also expected for certain specialty elastomers (such as acrylic rubber, polyester elastomers, butadiene copolymers, ethylene copolymers, modified polyethylenes, and fluorinated elastomers), polybutadiene, carboxylated styrene butadiene rubber latex, and ethylene-propylene rubber. However, for the five-year period through 1996, IISRP projects that consumption of all elastomers, except polychloroprene, will grow some on an annual basis. Because polychloroprene is being replaced by nitrile and thermoplastic elastomers in some high-temperature applications, consumption is expected to remain relatively stable at 77,000 metric tons, says Richard Killian, IISRP's administration director.

Natural rubber had an even rougher 1991 than its synthetic counterparts, with consumption dropping 5.3% from 1990 to about 846,000 metric tons. However, natural rubber is also expected to recover this year, with a 5.1% increase in consumption to 889,000 metric tons. In the forecast period 1990–96, IISRP expects natural rubber consumption to return to a traditional growth rate of about 1.7% annually, reaching consumption of 987,000 metric tons in 1996.

Susan Ainsworth

Thermoplastic elastomers to dominate rubber growth in North America

Consumption, thousands of metric tons	1992	% change 1991–92	1996	% annual change 1990–96
Styrene-butadiene rubber				
Solid[a]	766	4.5%	818	0.7%
Latex	50	4.2	54	1.3
Carboxylated latex	501	2.5	552	1.7
Polybutadiene	410	3.5	452	2.2
Ethylene-propylene	199	4.5	257	3.2
Polychloroprene	75	2.7	77	–0.2
Nitrile butadiene rubber				
Solid	71	0.4	73	1.1
Latex	37	0	38	1.1
Other synthetics	376	3.9	423	1.8
Thermoplastic elastomers	286	5.1	389	7.0
TOTAL SYNTHETIC RUBBER	**2770**	**3.7%**	**3133**	**2.1%**
Natural rubber	889	5.1	987	1.7
TOTAL RUBBER	**3659**	**4.1%**	**4120**	**2.0%**

a Includes high styrene. **Source:** International Institute of Synthetic Rubber Producers